DESIGN OF THE SHAPE OF THE EXPERIMENTAL CHAMBER FOR THE ANALYSIS OF THE PRESSURE LAYOUT IN THE DIFFERENTIAL PUMPED CHAMBER

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Abstract: This article is based on a study of Dr. Danilatos, where pumping of the differential pumped chamber is solved using the Monte Carlo statistical method. Similar results were obtained using the Ansys Fluent system. Theoretical computations as Dr. Danilatos and comparative studies are performed on theoretical shape. Simulations were made to obtain the shape of an experimental chamber with complete pumping shapes so that its shaping and pumping would ensure such a flow of gas to ensure the same distribution of pressure in the experimental chamber in the area under investigation as in the theoretical shape.

Keywords: Shockwave, ANSYS Fluent, ANSYS Mechanics, Optical methods, Pitot tube, Pressure measurement, Solidworks, Thermography,

1 INTRODUCTION

This article is based on a study of Dr. Danilatos [1], which deals with the pumping of the differential pumped chamber in the environmental scanning electron microscope using the Monte Carlo statistical method [2]. Based on these articles, a comparative study [3] was produced, where comparable results were obtained by Continuous Mechanics using the Ansys Fluent system using the finite volume method [4, 5, 6].

Currently, work is being done to experimentally measure the distribution of pressures and velocities in the area under investigation.

Theoretical computations as Dr. Danilatos and comparative studies are performed on theoretical shape (Fig. 1), which is a very truncated shape, where the boundary conditions are located immediately on the interface of the differentially pumped chamber (Fig. 1), on the contrary, it is necessary to create an experimental chamber with complete pumping shapes so that its shaping and pumping ensures such gas flow, to ensure the same distribution of pressure in the experimental chamber as in the theoretical shape.

2 RESULTS AND DISCUSSIONS

After the analysis, the shape of the experimental chamber was projected on figure 2. The profile of the results obtained by the analysis in this experimental shape is shown in the cut-out (Figure 2). It could be seen that the distribution of pressures is practically the same as the theoretical shape.

Comparative analysis were carried out in two key areas. The first is the distribution of pressures on the conical surface, from which the pressure values will be traced in practice and the second is in the axis of the primary electron beam. On (Fig. 3) Is a comparison of pressures on the sloping surface and on (Fig. 4) course velocity in the primary beam axis.

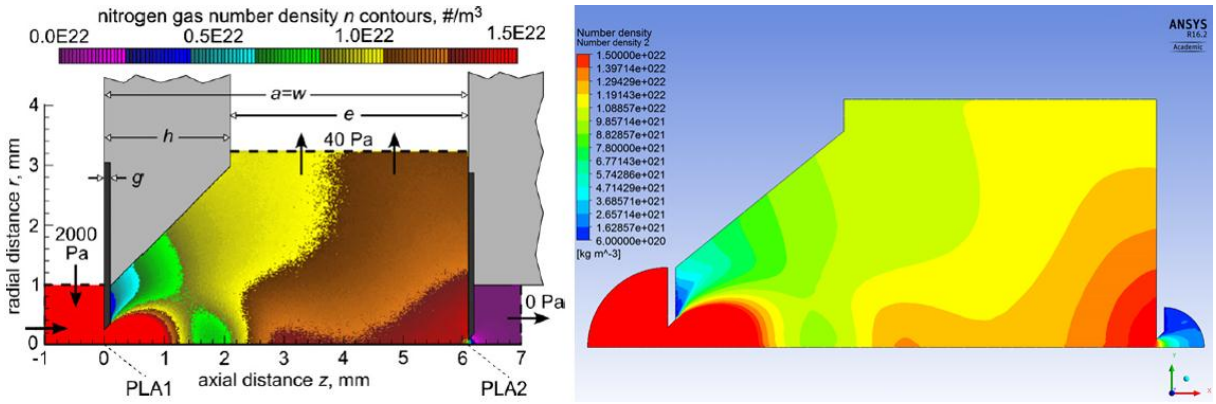

Figure 1: Comparison of simulation results: A - Monte Carlo, B - Mechanics Comtinuum

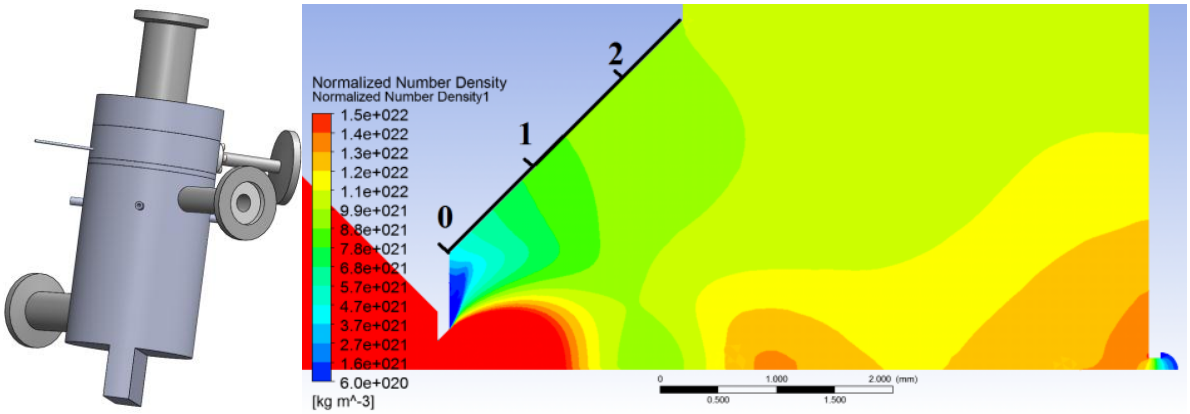

Figure 2: A - Experimental chamber, B – Results for the shape of the experimental chamber

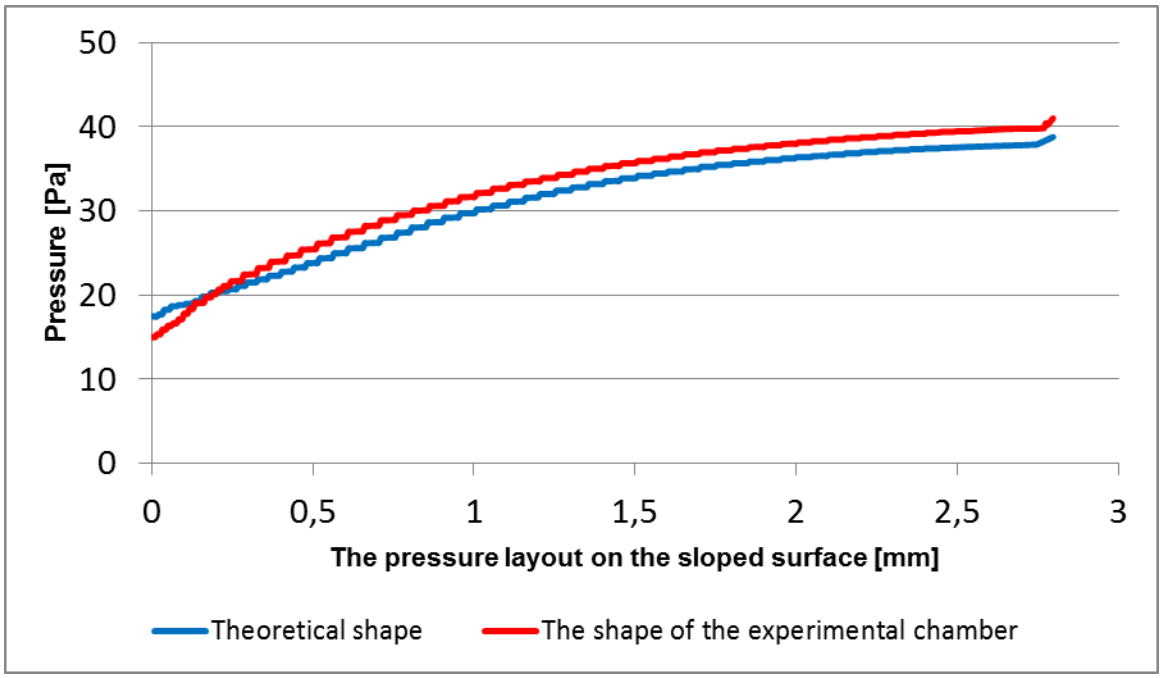

Figure 3: The pressure layout on the sloped surface.

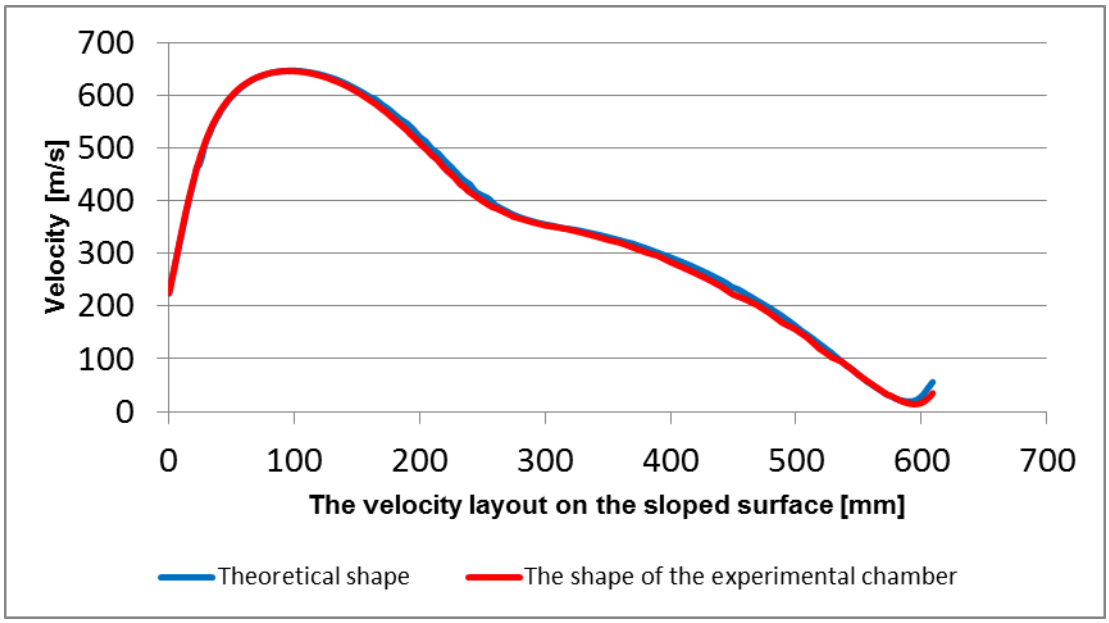

Figure 4: The velocity layout on the sloped surface

3 CONCLUSION

The results shows that final design of our shape of experimental chamber results into identical flowing character as theoretical shape and it is suitable for achieving experimental data for tuning system for differential reaching analysis in supersonic regime in low density pressure area.

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